CHAPTER 6: UNIVERSAL ACCESS

The diversity of California students presents unique opportunities and significant challenges for instruction. Students come to California schools with a wide variety of skills, abilities, and interests and with varying proficiency in English and other languages. The wider the variation of the student population in each classroom, the more complex the teacher's role becomes in organizing instruction in mathematics and ensuring that each student has access to high-quality mathematics instruction appropriate to the student's current level of achievement. The ultimate goal of mathematics programs in California is to ensure universal access to high-quality curriculum and instruction so that all students can meet or exceed the state's mathematics content standards. To reach that goal, teachers need assistance in designing instruction to meet the needs of all students. Through careful planning for modifying their curriculum, instruction, grouping, assessment techniques, or other variables, teachers can be well prepared to adapt to the diversity in their classrooms.

This chapter refers frequently to students with special needs, a primary concern in considering the issue of universal access. Students in this category, who are discussed in this chapter, are special education pupils, English learners, students at risk of failing mathematics, and advanced learners.

Procedures that may be useful in planning for universal access are as follows:

- Assess each student's understanding at the start of instruction and continue to do so frequently as instruction progresses, and use the results of *assessment* for student placement and program planning.
- *Diagnose* the nature and severity of a student's difficulty and intervene quickly when students have trouble with mathematics.

- Engage in careful organization of resources and instruction and *planning* for adapting to individual needs. Be prepared to employ a variety of good teaching strategies, depending on the situation.
- *Differentiate* curriculum or instruction or both, focusing on the mathematics content standards and the key concepts within the standards that students must understand to move on to the next grade level.
- Use *flexible grouping* strategies according to the students' needs and achievement and the instructional tasks presented. (Examples of these strategies are homogeneous, semi-homogeneous, heterogeneous, large group, and small group. Individual learning is also an option.)
- *Enlist help* from others, such as mathematics specialists, mathematicians, special education specialists, parents, aides, other teachers, community members, administrators, counselors, and diagnosticians, when necessary, and explore the use of technology or other instructional devices as a way to respond to students' individual needs.

Alignment of Instruction with Assessment

One of the first tasks required of a school district is to determine its students' current achievement levels in mathematics so that each student or group of students can be offered a structured mathematics program leading to the attainment of all the content standards. What the student already knows in mathematics should form the basis for further learning and study.

Assessment is the key to ensuring that all students are provided with mathematics instruction designed to help them progress at an appropriate pace from what they already know to higher levels of learning. Knowing which standards the students have mastered, teachers and administrators can better plan the instructional program for each student or for groups of students with similar needs. Regardless of

whether students are grouped according to their level of achievement in mathematics or some other factor, such as grade level, proficiency in English, or disability, assessment can be used to determine (1) which mathematical skills and understanding the student has already acquired; and (2) what the student needs to learn next. Regrouping can occur either within the classroom or across classrooms to place together students who are working on attaining a common set of mathematics standards.

For a variety of reasons, assessment of special needs students often reveals gaps in their learning. These gaps can be discovered through assessment, and instruction can be designed to remediate specific weaknesses without slowing down the students' entire mathematics program.

Successful Diagnostic Teaching

Students who have trouble in mathematics are at risk of failing to meet the standards, becoming discouraged, and eventually dropping out of mathematics altogether. The teacher should try to determine the cause of the challenges, which may develop for a variety of reasons. Often a student placed in a class or program lacks the foundational skills and understanding necessary to complete new assignments successfully. If a student does not speak fluent English, for example, language barriers may be the cause of depressed mathematics scores. Sometimes a student may have a persistent misunderstanding of mathematics, or the student may have practiced an error so much that it has become routine. These problems may affect his or her ability to understand and complete assignments. Confusing, inadequate, or inappropriate instructional resources or instruction might be a contributing factor. A teacher can use the results of assessment and classroom observations to determine which interventions should be tried in the classroom and

whether to refer the student to a student study team or to seek assistance from specialists.

Most challenges can be corrected with good diagnostic teaching that combines repetition of instruction, focus on the key skills and understanding, and practice. For some students modification of curriculum or instruction (or both) may be required to accommodate differences in communication modes, physical skills, or learning abilities. Occasionally, in spite of persistent and systematic assistance, a student will continue to slip further behind or will show gaps and inconsistencies in mathematical skills that cannot be easily explained or remedied. For this small group of students, special assistance is a must.

To plan appropriate strategies for helping students who are experiencing difficulty in mathematics, teachers should consider the degree of severity of the challenges according to the three major groups described next (Kame'enui and Simmons 1998). Intervention strategies will differ depending on the degree of severity.

Benchmark Group

Students in the benchmark group are generally making good progress toward the standards but may be experiencing temporary or minor difficulties. Although these students' needs are not intensive, they must be addressed quickly to prevent the students from falling behind. Often, the teacher can re-teach a concept in a different way to an individual or a group of students or schedule a study group to provide additional learning time. Occasionally, parents can be enlisted to reinforce learning at home. Ideally, instructional resources will be organized in ways that make it easy for parents to help. Some students may need periodic individual assistance, help from special education specialists, or assistive devices to ensure that they can succeed in the regular classroom. Once a student has grasped the concept or procedure correctly, additional practice is usually helpful. Most students will

experience the need for temporary assistance at some time in their mathematical careers, and all students should be encouraged to seek assistance whenever they need it.

Strategic Group

Students in the strategic group may be one to two standard deviations below the mean on standardized tests. However, their difficulties, which must be examined with systematic and, occasionally, intensive and concentrated care, can often be addressed by the regular classroom teacher with minimal assistance within the classroom environment.

A child-study team might be called on to discuss appropriate support for the student. In addition to reteaching a concept, the teacher may wish to provide specific assignments over a period of time for students to complete with a peer or tutor or by themselves at home. Regular study groups meeting before or after school, in the evenings, or on weekends can provide an effective extension of the learning time. Some students may need to take two periods of mathematics a day to master difficult content in order to accelerate progress to grade-level standards. Others, such as special education students, may need special modifications of curriculum or instruction to enable them to participate successfully in a mainstream classroom.

Intensive Group

Students in the intensive group are seriously at risk of failing to meet the standards as indicated by their extremely and chronically low performance on one or more measures. The greater the number of measures and the lower the performance, the greater is the students' risk. In general, these students perform more than two standard deviations below the mean on standardized measures and should be referred to a student study team for a thorough discussion of options. A

referral to special education may be advisable. If eligible for special education services, these students will be given an individualized education program, which will describe the most appropriate program for the student. Often, specialized assistance will be available through the special education referral. Such assistance may include intensive intervention by a qualified specialist, tutoring, the services of a classroom assistant, specialized materials or equipment (or both), or modification of assessment procedures. Students in the intensive group must be supported by additional instructional time during the school day.

Planning for Special Needs Students

Students with disabilities are provided with access to all the content standards through a rich and supported program that uses instructional materials and strategies that best meet their needs. A student's 504 accommodation plan(1) or individualized education program (IEP)(2) often includes suggestions for a variety of techniques to ensure that the student has full access to a program designed to provide him or her with mastery of the mathematics standards, including those in the mathematical reasoning strand, which is inherently embedded in each of the other strands. Mathematical reasoning is fundamental in developing the basic skills and conceptual understanding for a solid mathematical foundation. Teachers must familiarize themselves with each student's 504 accommodation plan or IEP to help the student in achieving mastery of the mathematics standards.

There are numerous ways in which a teacher can implement accommodations in mathematics instruction. Disabilities vary widely, and accommodations must be tailored to the student's individual and unique needs. Text may be printed in larger fonts for low-vision students. Because of the incidence of red-green color-blindness in some male students, instructions should not be red-green color coded.

Educators may visit the following Web sites to obtain resources for understanding and addressing the needs of students with disabilities:

- "California Special Education Programs: A Composite of Laws Database," *Education Code*, Part 30, Other Related Laws, and *California Code of Regulations, Title 5* at *http://www.cde.ca.gov/spbranch/sed/lawsreg2.htm.*
- *A Composite of Laws, 2004, 26th Edition.* (To order a copy contact CDE Press at [800] 995-4099 or visit the Department Web site *http://www.cde.ca.gov/spbranch/sed/compordr.htm*

Experienced teachers develop a repertoire of good instructional strategies to be used in special situations or with specific groups of students. Many of these strategies can be explicitly taught or can be embedded in instructional materials. To establish successful instructional strategies for all students, the teacher should:

1. Establish a safe environment in which the students are encouraged to talk and to ask questions freely when they do not understand.
2. Use a wide variety of ways to explain a concept or assignment. When appropriate, the concept or assignment may be depicted in graphic or pictorial form, with manipulatives, or with real objects to accompany oral instruction and written instructions.
3. Provide assistance in the specific and general vocabulary to be used for each lesson prior to the lesson and use reinforcement or additional practice afterward. Instructional resources and instruction should be monitored for ambiguities or language that would be confusing, such as idioms.
4. Set up tutoring situations that offer additional assistance. Tutoring by a qualified teacher is optimal. Peer or cross-age tutoring should be so designed that it does not detract from the instructional time of either the tutor or tutee, and it should be supervised.

5. Extend the learning time by establishing a longer school day, a double period of mathematics classes, weekend classes, and intersession or summer classes.
6. Enlist the help of parents at home when possible.
7. Establish special sessions to prepare students for unfamiliar testing situations.
8. Ask each student frequently to communicate his or her understanding of the concept, problem, or assignment. Students should be asked to verbalize or write down what they know, thereby providing immediate insight into their thinking and level of understanding.
9. Use a variety of ways to check frequently for understanding. When a student does not understand, analyze why. This analysis may involve breaking the problem into parts to determine exactly where the student became confused.
10. Allow students to demonstrate their understanding and abilities in a variety of ways while reinforcing modes of communication that are standard in the school curricula.

Sequential or Simultaneous Instruction for English Learners

English fluency and academic achievement in the core curriculum do not need to be achieved simultaneously but may be addressed sequentially provided that, over a reasonable period of time, English learners do not suffer academically, as measured under the federal standards established in *Castaneda v Pickard* 648 F2d 989 (5th Cir 1981). It may be appropriate in some contexts to develop literacy in English initially, even if that approach delays progress toward achieving the standards. The English learner ultimately will have to acquire the English proficiency comparable to that of the average native speaker of English and to recoup any academic deficits resulting from the extra time spent on English-language development. Thus, a school may elect first to focus on the development of English language skills and

later to provide compensatory and supplemental instruction in mathematics so that an English learner can make up for academic deficiencies.

Differentiation in Pacing and Complexity

Advanced students and those with learning difficulties in mathematics often require systematically planned differentiation strategies to ensure appropriately challenging curriculum and instruction. The strategies for modifying curriculum and instruction for special education or at-risk students are similar to those used for advanced learners and can be considered variations along four dimensions: pacing, depth, complexity, and novelty. Two dimensions will be discussed here, pacing and complexity. Many of these strategies are good for all students, not just for those with special needs.

Pacing

Pacing is perhaps the most commonly used strategy for differentiation. That is, the teacher slows down or speeds up instruction. This strategy can be simple, effective, and inexpensive for many students with special needs (Benbow and Stanley 1996; Geary 1994). An example of pacing for advanced learners is to collapse a year's course into six months by eliminating material the students already know (curriculum compacting). Or students may move on to the content standards for the next grade level (accelerating). For students whose achievement is below grade level in mathematics, an increase in instructional time from 60 to 90 or 120 minutes may be appropriate.

Complexity

Modifying instruction by *complexity* requires more training and skill on the part of the teacher and instructional materials that lend themselves to such variations. For

students experiencing difficulty in mathematics, teachers should focus on the key concepts within the standards and eliminate confusing activities or variables.

Research shows that advanced students benefit most from a combination of acceleration and enrichment (Shore et al. 1991). These modifications can be provided either within a class or by the regrouping of students across classes or grade levels.

Differentiation for special needs students is sometimes questioned by those who say that struggling students never progress to the more interesting or complex assignments. This concern is often used to move struggling students along or to involve them in complex assignments even though they have not mastered the basics they need to understand the assignments. This framework advocates a focus on essential concepts embedded in the standards and frequent assessment to ensure that students are not just “passed along” without the skills they will need to succeed in subsequent grades. Struggling students are expected to learn the key concepts well so that they develop a foundation on which further mathematical understanding can be built.

Accelerating the Learning of At-Risk Learners

When students begin to fall behind in their mastery of mathematics standards, immediate intervention is warranted. Interventions must combine practice in material not yet mastered with instruction in new skill areas. Students who are behind will find it a challenge to catch up with their peers and stay current with them as new topics are introduced. Yet the need for remediation cannot be allowed to exclude these students from instruction in new ideas. In a standards-based environment, students who are struggling to learn or master mathematics need the richest and most organized type of instruction. This strategy will be very effective for the benchmark and strategic groups of students described by Kame’enui.

Students who have fallen behind, or who are in danger of doing so, need more than the normal schedule of daily mathematics. Systems must be devised to provide these students with ongoing tutorials. While it is important to offer special before/after school or Saturday tutorials, to ensure access for all students, extra help and practice should occur in extra periods of mathematics instruction during the school day.

As students in the eighth grade are assigned to formal mathematics courses, such as Algebra I or a first-year integrated course, new systems must be devised that provide students with support when they reach a point at which their eventual failure of the course is obvious. Requiring a student with intensive learning challenges to remain in a course for which he or she lacks the foundational skills to master the major concepts, and thereby to pass the course, wastes student learning time. Course and semester structures and schedules for classes should be reexamined and new structures devised so that students enrolled in such essential courses as Algebra I can ultimately complete the full course. Algebra Readiness instructional materials, described in Appendix E, are intended for students who are not ready for Algebra in eighth grade. Also, targeted intervention support at seventh grade and earlier can prevent or lessen the failure in algebra of many eighth grade students. Mathematics Intervention instructional materials, described in Appendix E, are intended for students in grades four through seven who are having trouble achieving at grade level.

Intervention support can be provided in a variety of instructional settings. For example, at the end of the first quarter or semester, classes might be reorganized so that students who are hopelessly lost and failing could enter a new course or receive extra support focused on strengthening and rebuilding foundational concepts and skills that are lacking from earlier grades. Instructional time might be extended in summer school or by enrolling students in a longer block of time for algebra during

the regular school year. In either event the student would be more likely to succeed than if he or she were to remain in the Algebra I course for the entire school year and receive failing grades or to drop the class and miss out on instruction in mathematics altogether for the balance of the school year. In the past many students were reassigned to a basic general or remedial-level class, thereby limiting their opportunity to complete Algebra I, a critical gateway course.

Transitional Materials

The primary goal of transitional materials should be to move students up to grade level. Most students are capable of mastering the mathematics content standards. First, it is important for teachers to have a strong grasp of the content area. Second, they must use instructional materials that facilitate the transitional period. The mathematics content standards were approved by the State Board of Education in December 1997; therefore, teachers should have passed the transitional phase of implementing them. However, many students are struggling to attain mastery of the standards at their grade level. This situation is especially true for students taking algebra in the eighth grade. Instructional materials that clearly identify the highest priority instructional activities are necessary to prepare students for meeting the grade-level requirements. **This material must include strong diagnostic assessments, provide targeted intervention on necessary foundation concepts that support grade-level standards, and allow students to accelerate their progress to meeting the standards.. (Refer to Appendix E).**

In helping students move from below grade level to grade level, teachers should always use materials that are standards aligned; however, in a transitional period, students should receive instruction that is aligned with fundamental concepts that support the grade-level standards. Increased instructional minutes is an important component to success for students in transition.

Grouping as an Aid to Instruction

Research shows that what students are taught has a far greater effect on their achievement than how they are grouped (Mosteller, Light, and Sachs 1996). The first focus of educators should always be on the quality of instruction; grouping is a secondary concern. This framework recommends that educators use common sense about grouping. Grouping is a tool and an aid to instruction, not an end in itself. As a tool it should be used flexibly to ensure that all students achieve the standards; instructional objectives should always be based on the standards.

For example, a teacher may discover that some students are having trouble understanding and using the Pythagorean theorem. Without this understanding they will have serious difficulties in algebra or geometry. It is perfectly appropriate, even advisable, to group those students who do not understand a concept or skill, find time to reteach the concept or skill in a different way, and provide additional practice. At the same time those students might be participating with a more heterogeneous mix of students in other classroom activities and in an evening study group in which a variety of mathematics problems are discussed.

Teachers must rely on their experiences and judgment to determine when and how to incorporate grouping strategies into the classroom. To promote maximum learning when grouping students, educators must ensure that assessment is frequent, that high-quality instruction is always provided, and that the students are frequently moved into appropriate instructional groups according to their needs. (*Note:* A more extensive discussion of grouping appears in Loveless 1998.)

English learners of different ages and with different primary languages may be grouped in the same classroom according to their English-language proficiency. These students would be educated in a structured English immersion program during a temporary transition period when the students acquire a good working

knowledge of English. Mathematics instruction can be provided simultaneously (i.e., as English is acquired), or it may be scheduled sequentially (i.e., after a good working knowledge of English has been acquired). Once the necessary level of English is attained, these students would be instructed in an English mainstream setting.

Research on Advanced Learners

Advanced learners, for purposes of this framework*,* are students who demonstrate or are capable of demonstrating performance in mathematics at a level significantly above the performance of their age group. They may include (1) students formally identified by a school district as gifted and talented pursuant to California *Education Code* Section 52200; and (2) other students who have not been formally identified as gifted and talented but who demonstrate the capacity for advanced performance in mathematics. In California it is up to each school district to set its own criteria for identifying gifted and talented students; the percentage of students so identified varies, and each district may choose whether to identify students as gifted on the basis of their ability in mathematics. The research studies cited in this framework use the term *gifted students,* which is defined in most areas outside California in a more standardized way, in accord with nationally normed tests of achievement or intelligence. In that context *gifted students* usually refers to the top few percent of students who score at the highest percentiles on the tests.

A research study (Shore et al. 1991, 281) examined whether evidence exists to support 101 common practices in gifted education and found that very few practices were supported by solid evidence. However, the study also found that a combination of acceleration (students move on to material above grade level) and enrichment (students study topics in more depth or complexity or study related topics not

covered in the normal curriculum) is supported by the research and leads to improved achievement for gifted students.

How to group advanced learners has been controversial. In a longitudinal study of grouping arrangements for over 1,000 elementary-age students, it was found that gifted students receiving an enriched and accelerated curriculum delivered in special schools, special day classes, and pullout programs made statistically significant increases in achievement in language arts, mathematics, science, and history–social science in comparison with gifted students who did not receive special programming (Delcourt et al. 1994).

The only type of programming arrangement that did not result in statistically significant improvement in achievement was enrichment offered in the regular heterogeneously grouped classroom. The reason for the lack of success was that even with the best of intentions, teachers did not have enough time to deliver the advanced or enriched curriculum they had planned for gifted students. Because most gifted students in California are served in the regular heterogeneously grouped classroom, teachers must ensure that enrichment or acceleration does occur, as argued for persuasively in the study (Delcourt et al. 1994).

Standards-based education offers opportunities for students who have the motivation, interest, or ability (or all of these) in mathematics to excel. Several research studies have demonstrated the importance of setting high standards for all students, including gifted students. The content standards in mathematics provide students with goals worth reaching and identify the point at which skills and knowledge should be mastered. The natural corollary is that when standards are mastered, students should either move on to standards at higher grade levels or focus on unlearned material not covered by the standards.

If, in a standards-based mathematics program, continual assessments of student achievement are calibrated to provide accurate measures of the uppermost reaches

of each student's level of mathematical knowledge, the results will show that some students demonstrate mastery of the standards being studied by their peers, and a few others demonstrate complete mastery of all the standards for that grade level. A practical, common-sense response to students with such advanced ability would be to begin instruction in the next year's standards and continue to support the students' learning of new material and skills. A more common approach would be to provide such students with enrichment and depth in studying the standards for their grade level. However, with such an approach, enrichment or extension must actually occur and lead the student to complex, technically sound applications. There is a danger that enrichment experiences may become activities for marking time with interesting problems that do not actually contribute to higher learning or new insight.

If programs allow advanced students to move forward in the curriculum, schools will begin once more to produce young people who can compete at the highest levels in technological, mathematical, and science-based postsecondary and graduate studies and in professional fields yet to be developed. To fail to provide mathematically talented students with continuous new learning and challenges is to fail to develop a precious national resource and, in the name of equity, to consign all students to reach only the same average expectations (Benbow and Stanley 1996).

Accelerating the learning of talented students requires the same careful, consistent, and continual assessment of their progress as is needed to serve and advance the learning of average and struggling students. It is what schools do with the information from such assessments that challenges the educational system to reexamine its past practices. Elementary schools might be organized, for example, not around grade-level teams but around teams that span at least three grade levels. Such grade-span teams could provide mathematics instruction through flexible teaching focused on specific levels of the standards regardless of the students' grade levels. For example, in a team with students in grades three, four, and five, a

mathematically advanced fourth grader might work with a group of fifth graders. Or a group of advanced third graders might work with fourth graders in need of an opportunity to relearn third-grade skills in an accelerated program. Through the use of such a system, learning groups might be regularly reorganized according to the students' mastery of standards so that the team members would be constantly working to move the students in the group forward.

Care must be taken in the design of standards-based programs to avoid the errors of the past. *In a standards-based classroom, the design of instruction demands dynamic, carefully constructed, mathematically sound lessons devised by groups of teachers pooling their expertise in helping children to learn.* These teams must devise innovative methods for using regular assessments of student progress to assign students to instructional groups in which teaching is targeted to ensure each student's progress toward mastery of world-class standards. (For more information on advanced learners, see the references section at the end of this framework.)

Notes

1. A Section 504 accommodation plan is a document typically produced by school districts in compliance with the requirements of Section 504 of the federal Rehabilitation Act of 1973. The plan specifies agreed-on services and accommodations for a student who, as a result of an evaluation, is determined to have a "physical or mental impairment [that] substantially limits one or more major life activities." In contrast to the federal Individuals with Disabilities Education Act (IDEA), Section 504 allows a wide range of information to be contained in a plan: (1) the nature of the disability; (2) the basis for determining the disability; (3) the educational impact of the disability; (4) necessary accommodations; and (5) the least restrictive environment in which the student may be placed.

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2. An IEP is a written, comprehensive statement of the educational needs of a child with a disability and the specially designed instruction and related services to be employed to meet those needs. An IEP is developed (and periodically reviewed and revised) by a team of individuals, including the parent(s) or guardian(s), knowledgeable about the child's disability. The IEP complies with the requirements of the IDEA and covers such items as (1) the child's present level of performance in relation to the curriculum; (2) measurable annual goals related to involvement and progress in the curriculum; (3) specialized programs (or program modifications) and services to be provided; (4) participation with non-disabled children in regular classes and activities; and (5) accommodation and modification in assessments.